

# Comparative Study of Modified Technique of Laparoscopic Appendicectomy in Adults and Children for Uncomplicated Appendicitis

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## Abstract

**Background:** Conventional laparoscopic (Lap) appendicectomy (LA) done with three ports is widely accepted. Efforts have been made to decrease the port sites by single incision lap surgery and natural orifice transluminal endoscopic surgery using special instruments. Our modified technique describes a two-port technique using conventional instruments with port sites being invisible and feasible both in adults and children.

**Materials and Methods:** About 52 patients, with 26 adults and 26 children were studied from October 2013 to October 2015. Two-port LA was carried out in all with equally good results.

**Results:** Mean operative time was less in adults. Post-operative pain and hospital stay were less in children.

**Conclusions:** Two-port technique can be performed in both adults and children with uncomplicated appendicitis. However, it is slightly difficult and time-consuming in children because of less work space.

**Key words:** Laparoscopic appendicectomy, Puppeteer technique, Two ports

## INTRODUCTION

In acute appendicitis (AA), the most common surgical emergency, trend is toward laparoscopic (Lap) appendicectomy (LA). Appendicectomy has evolved in the past 120 years, from Mc Burney's long incision to minimally invasive LA to barely noticeable incisions after single incision lap surgery (SILS). The results of conventional LA (CLA) with three ports have compared favorably those for open appendectomies (OAs) for the past 10 years because of decreased pain, fewer post-operative complications, shorter hospitalization, earlier return to work, and better cosmesis.<sup>1-3</sup> Efforts are

still being made to decrease the ports by SILS requiring umbilical multiport and special instruments having a steep learning curve due to loss of triangulation, clashing of instruments, lack of maneuverability, decreased exposure, and cost that limits its widespread nature.<sup>3,4</sup> Recently, natural orifice transluminal endoscopic surgery (NOTES) has problems such as complications of opening hollow viscera, failed sutures, lack of fully developed instruments, and cost-benefit analyses.<sup>5,6</sup> In CLA from a cosmetic viewpoint, the sub-umbilical (SU) and supra-pubic (SP) port sites are hidden by natural camouflages, while scar of the third port in the iliac fossa is the only visible external operative sign. The modified technique of two-port LA (TLA) avoids even this third port. TLA is virtually scarless as the two port sites are hidden within the natural camouflages and replicates the intraperitoneal view and operative technique of CLA. Hence, it is associated with a very short learning curve<sup>1</sup> and compared to SILS and NOTES, there is no need for expensive special equipment. In our study, we assess the practicality of TLA in adults and compare with children.

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## MATERIALS AND METHODS

This is a prospective study. Cases admitted in Sri Siddhartha Medical College and Hospital, Tumkur, who were diagnosed as uncomplicated AA based on clinical, laboratory, and sonographic findings between October 2013 and October 2015 (24 months) were included. Patients unfit for general anesthesia (GA) and Lap, peritonitis, perforated appendicitis or appendiceal abscess, coagulation disorders, and pregnancy were excluded. Patients were segregated as adult "A" (>18 years) and child "C" (<18 years) groups. Informed consent and ethical clearance were obtained. Prophylactic antibiotic was administered. Patients were made to void urine just before lying on the operation table. GA was induced. Duration was calculated from time of skin incision to its closure. Postoperatively, the patients were nil per orally and on IV fluids for 24 h. Ambulation, oral fluids, and oral antibiotics were initiated from the 1<sup>st</sup> post-operative day onward. Patients were observed for any complications and then discharged and followed up on the 7<sup>th</sup> day. They were informed to report if any problems arise and were followed till 6 months.

### Technique of TLA

Pneumoperitoneum of 10-12 mmHg was created and 10 mm SU optical port was introduced. Under direct vision, a 5 mm SP working port was introduced just below the pubic hairline. Diagnostic Lap was done and appendix was identified. Needle loop retractor (NLR) is prepared with an 18 G hypodermic needle and a 1-0 polypropylene suture material (Figure 1). The suture material is passed through the hypodermic needle and brought out to form a loop. This NLR was inserted into the right iliac fossa (RIF) under vision and was used to hold the appendix into the loop like a puppet (puppeteer technique)<sup>7</sup> and the hollow needle was removed. The loop holding the appendix is pulled by the surgeon extracorporeally similar to the puppeteer (Figure 2) moving the limbs of his puppet.<sup>8</sup> Through the SP port, appendicular artery was cauterized, mesoappendix was transected, the base of the appendix was ligated, appendicectomized, and delivered via the SU port.

### Statistical Analysis

The statistical analysis was performed using Chi-square test for categorical variables.

The Student's *t*-test was used for calculating continuous scale variables.  $P < 0.05$  was considered significant. Where appropriate, data are reported as mean  $\pm$  standard deviation.

## RESULTS

Of the 55 patients operated, 3 patients required conversion, one child required addition of third port for adhesiolysis, and 2 adults were converted into TLA and then to OA due to sub-hepatic retrocecal appendix. Lap mobilization of appendix was tried, but with futile attempts thus requiring conversion, hence these 3 patients were eliminated. This is a comparative study with 26 adults and 26 children. Undergoing TLA procedure was to know the feasibility based on the duration of operation, post-operative pain, and complications. Descriptive statistical analysis has been carried out.

### Age

In "C" group, there are 10 children (0-10 years) and 16 patients (11-18 years). In "A" group, there are 15 patients (18-40 years) and 11 patients (40-60 years).



Figure 1: Needle loop retractor



Figure 2: Puppeteer technique

**Sex**

In A group, there were 9 females and 17 males whereas in C group, there were 8 females and 18 males.

**Duration**

The mean operative time was 67.8 min for A group and 73.07 min C group with  $P = 0.01$ . The overall mean operative time was significantly less in A group compared to C group. The mean operative time for adults in Fazili *et al.*<sup>9</sup> series was 35 min (n=129), Panait *et al.*<sup>10</sup> series was 64.1 min (n=8), Rammohan *et al.*<sup>11</sup> series was 55.7 min (n=62) & Olijnyk *et al.*<sup>12</sup> series was 64.5 min (n=42) which is less when compared to C group.

**Post-operative Pain**

Post-operative pain was assessed using visual analog scale. In A group, there were 9 patients (35%) with a score of <3 (mild pain), 12 patients (46%) with a score of 3-6 (discomforting), and 5 patients (19%) with a score of >6 (distressing). In C group, there were 16 patients (61.5%) with a score of <3 (mild pain), 8 patients (30.7%) with a score of 3-6 (discomforting), and 2 patients (7.6%) with a score of >6 (distressing). Patients in C group had less pain than those in A group.

Chi-square = 4.05,  $P = 0.13$ , and insignificant.

**Post-operative Complications**

There were only 7 patients with minor complications of surgical site infection. Five patients (19.2%) in group A and 2 patients (7.6%) in group C had minor wound infection which is statistically insignificant ( $p$  value is 0.22).

**Hospitalization**

In A group, 9 patients (35%) had a hospital stay of 0-2 days, 12 patients (46%) had a hospital stay of 2-4 days, and 5 patients (19%) had a hospital stay of 4-6 days. In C group, 16 patients (61.5%) had a hospital stay of 0-2 days, 8 patients (30.7%) had a hospital stay of 2-4 days, and 2 patients (7.6%) had a hospital stay of 4-6 days.  $P < 0.0001$  was observed which is statistically very significant. C group had a significantly less hospital stay in comparison to A group. Hospitalization in studies by Fazili *et al.*<sup>9</sup> ( $n = 129$ ) was 2.8 days, Panait *et al.*<sup>10</sup> ( $n = 8$ ) was 1 day, and Rammohan *et al.*<sup>11</sup> ( $n = 62$ ) was 2.1 days. Shorter stay in TLA might be due to lesser post-operative pain to the patients.<sup>10</sup>

**DISCUSSION**

This study was undertaken to establish the feasibility of modified technique of TLA in children and compared with adults. It was fairly easier to perform TLA in adults and

in children between 11 and 18 years in comparison with those of children <10 years with less working space. TLA was cosmetically more acceptable by both genders. Female patients were particularly happier about the absence of the visible RIF scar. The mean duration was more in C group than A group due to less work space, which is an important drawback of TLA. The maneuverability with single instrument is difficult and sometimes, it is more tedious in case of hidden appendicitis, due to retrocecal position and adhesions requiring rescue port or even conversion to open. The TLA procedure had initially taken some time to learn, but once learnt, it will be easier to perform. It also had taken more time in case of a short appendix and in cases on adhesions. The patients in C group had less post-operative pain than that of A group. There were no major complications in either group. Shorter hospital stay in TLA might be due to lesser post-operative pain in the patients.<sup>10</sup> Mean hospital stay was less in children than adults. TLA is cheaper due to less hospital stay and less pain as it requires only two ports, thus would have an added advantage of not requiring an assistant surgeon. The patient can resume his routine activities much earlier. In CLA, the use of 5 mm port iliac fossa leaves clearly visible scars. We have demonstrated that TLA using NLR in the RIF and the SP trocar placed below the hairline to be a safe and feasible procedure. It also has other advantages, even when inflammation is extensive, the ability to hold both the appendix and the mesoappendix at the same time with a NLR enables more stable manipulation and countertraction than the use of conventional forceps, and this procedure is also associated with less risk of causing an uncontrolled tear in the mesoappendix or an iatrogenic perforation of the appendix. Even though we have described the site of NLR as RIF, flexibility in its placement is vital and best decided by intraoperative view of the pathology. The NLR can easily be sited elsewhere in the abdomen so as to ergonomically and cosmetically suit the pathology and the surgeon. If necessary, a surgeon can easily convert a TLA to CLA by adding another trocar (port rescue) preserving safety of the patient. TLA also eliminates one site of peritoneal invasion thereby reducing the chances of adhesions. Hiding the port sites in the natural camouflages such as subumbilicus and SP hairline improves cosmesis (Figure 3).<sup>13</sup> Mini-lap appendectomies using 2-3 mm or even smaller instruments along with one 12 mm port minimizes pain and improves cosmesis.<sup>14-16</sup> More recently, studies by Roberts *et al* has described variants of an intracorporeal sling based SILS with good clinical results.<sup>7</sup> TLA has an advantage over SILS and NOTES in being safe, easy, feasible, and economical by not requiring specialized instruments. TLA is safe and feasible in children with the operative time and post-operative complications being the same to that of adults.<sup>9</sup>



Figure 3: Port sites

## CONCLUSION

TLA is safe, cost-effective, cosmetically effective, and easy to learn and perform. Its esthetic benefits are comparable to SILS and NOTES without requiring any special instruments. If intraoperatively found to be difficult, it can be converted into CLA by introducing a third port. It can be readily done in all cases of uncomplicated appendicitis. However, in children, it may pose little difficulty due to less work space.

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